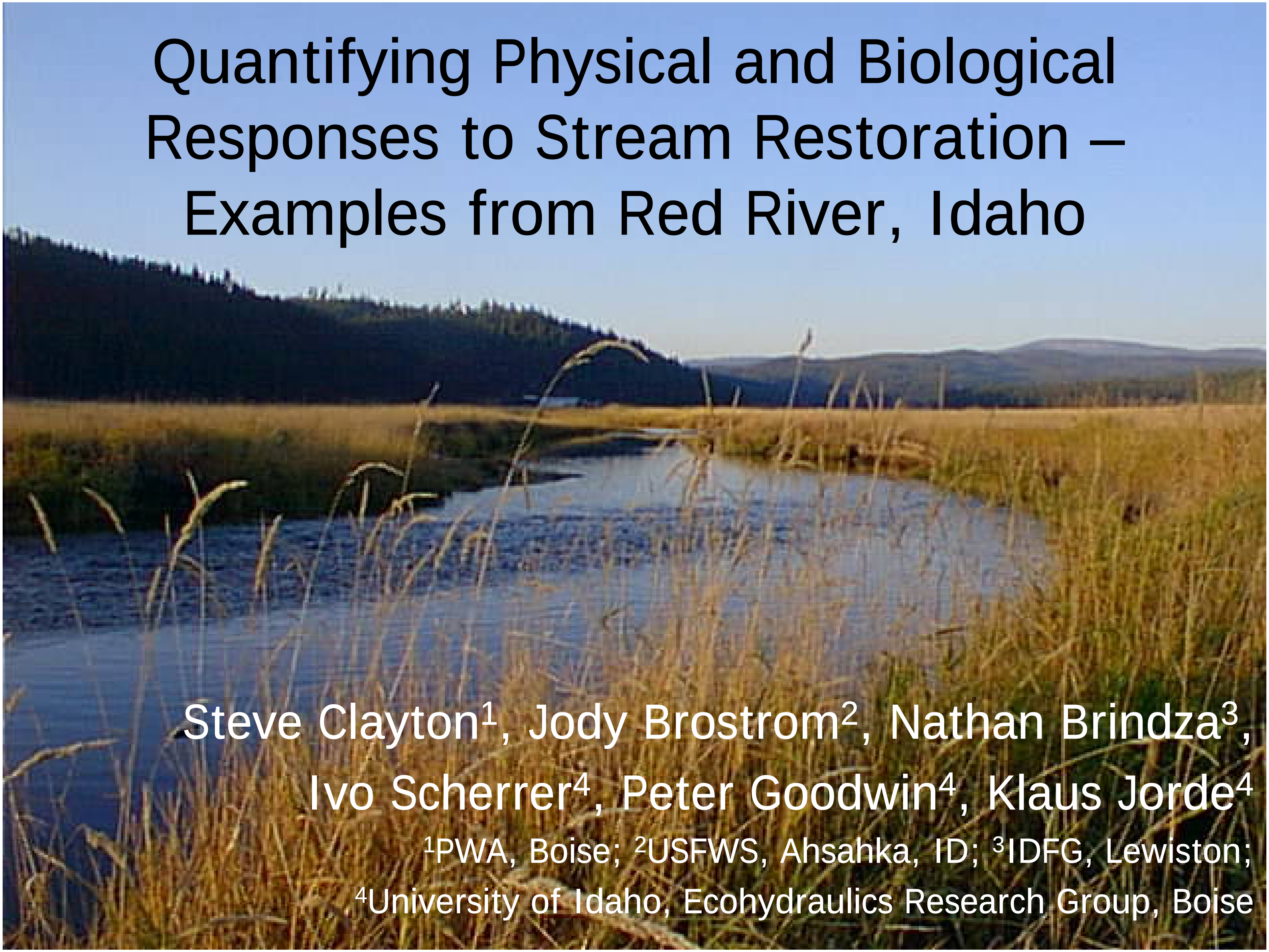

Quantifying Physical and Biological Responses to Stream Restoration – Examples from Red River, Idaho

Steve Clayton[1], Jody Brostrom[2], Nathan Brindza[3], Ivo Scherrer[4], Peter Goodwin[4], Klaus Jorde[4]

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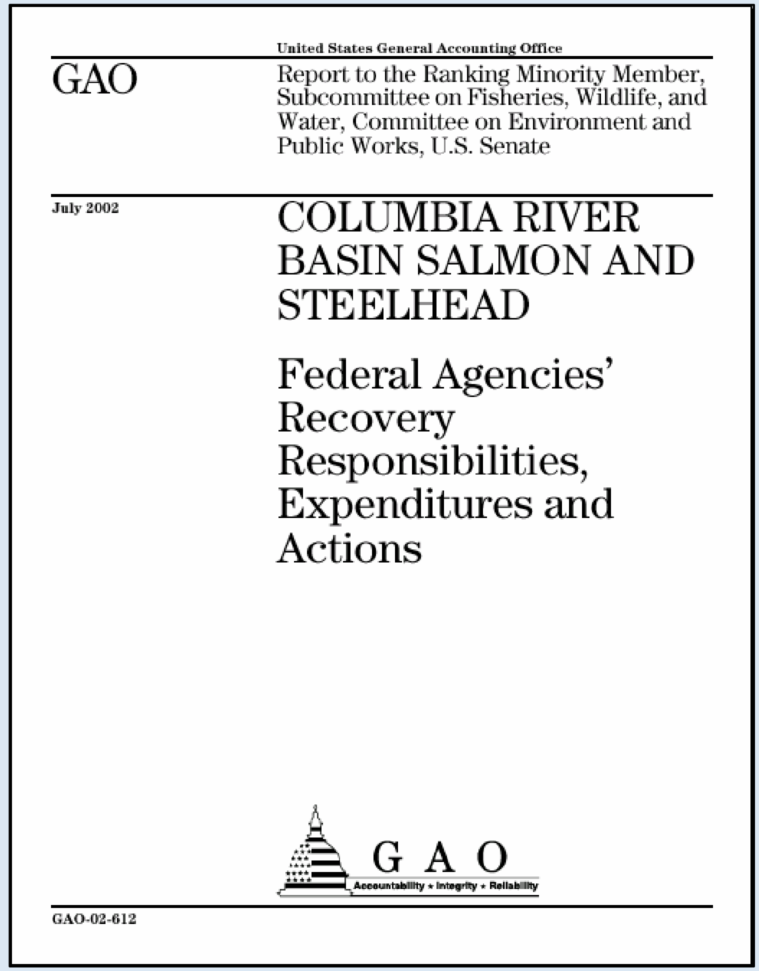
Presentation Preview

- Restoration realities and monitoring challenges
- Study findings investigating potential for detecting restoration responses
- Implications for development of monitoring plans
- An example approach for scaling up

Restoration Realities

- Substantial funds are being spent in the Columbia River Basin
  - Over $3 billion from 1985-2000 for salmon research and restoration (Botkin et al. 2000)
  - $1.5 billion from FY97-FY01 for salmon and steelhead recovery (GAO 2002)
- Lack of accountability and proof of project effectiveness
  - Anybody can claim anything is restoration
- Emerging backlash against restoration

- Monitoring is one component to address these realities



United States General Accounting Office

GAO

Report to the Ranking Minority Member, Subcommittee on Fisheries, Wildlife, and Water, Committee on Environment and Public Works, U.S. Senate

July 2002

COLUMBIA RIVER BASIN SALMON AND STEELHEAD

Federal Agencies' Recovery Responsibilities, Expenditures and Actions

G A O

Accountability * Integrity * Reliability

GAO-02-612

Monitoring Challenges

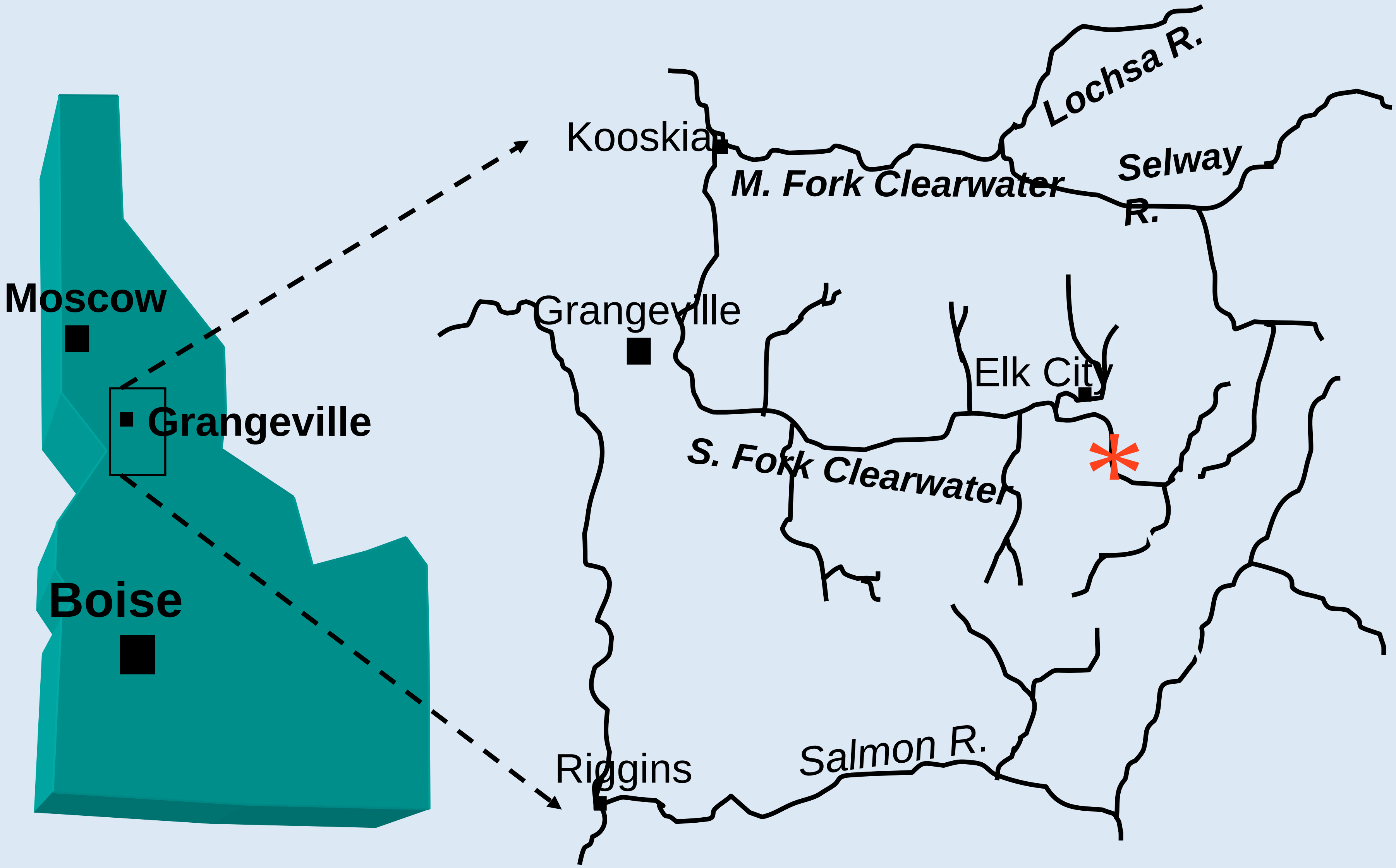
- Limited funding
  - Some agencies can fund implementation, but not monitoring
- Life cycles of target species are long compared to time frames in which management decisions are expected
  - Management focuses on implementation targets (miles of channel stabilized, # of structures installed), not long-term response
- Uncertainty of what to monitor
  - Identification and quantification of those parameters which demonstrate measurable response to restoration

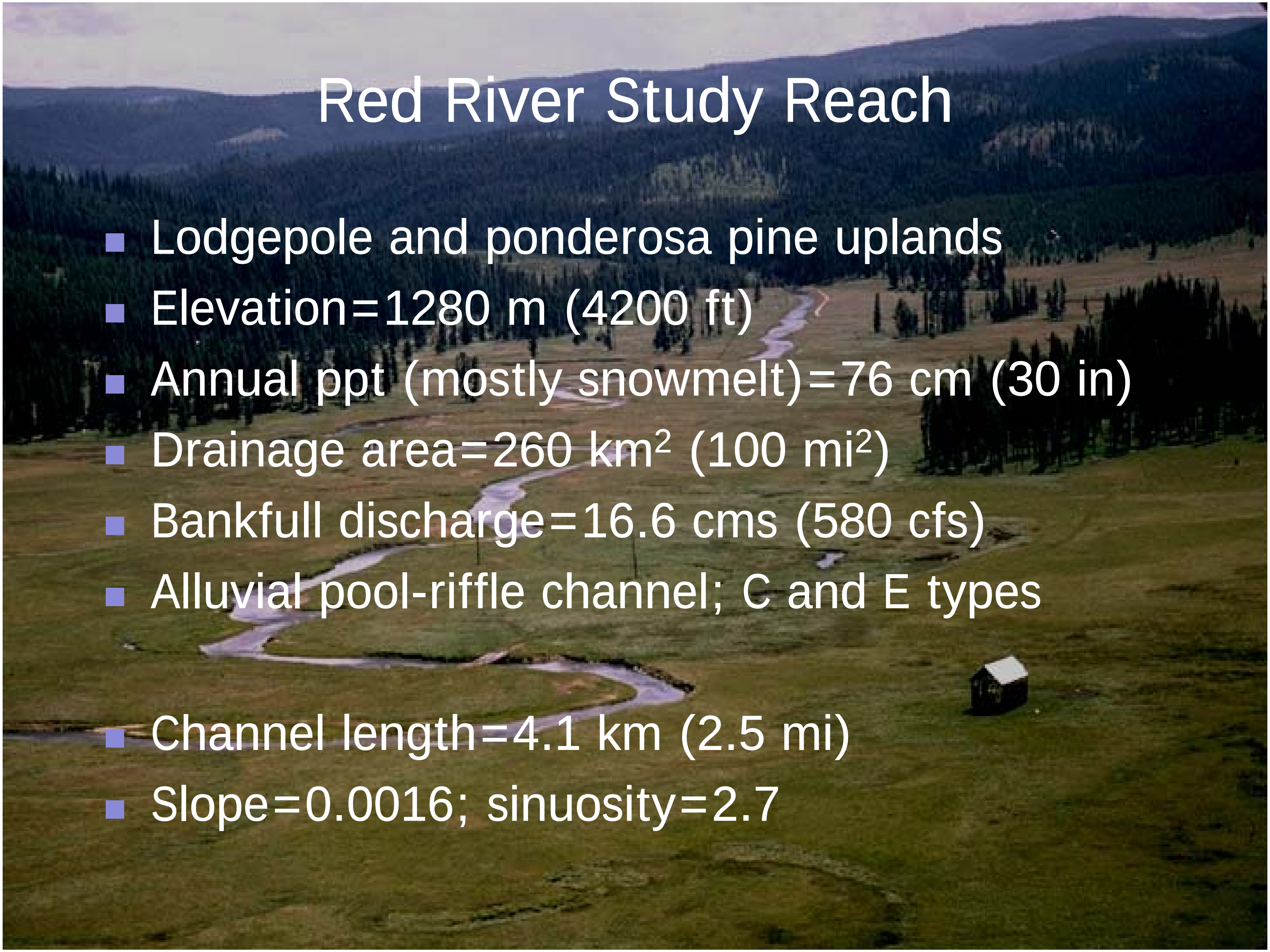
Uncertainty in Ecological Restoration Monitoring

- Data sets are spatially-sparse and of short-duration.
- Detectable change from restoration is a small percentage of diurnal, seasonal, or inter-annual variability.
- Effects occur at multiple spatial and temporal scales.
- Individual restoration actions may have cumulative responses that are less predictable.

Restoration goal	Typical restoration activity	Individual physical responses			Cumulative responses	
		Shear stress	Particle size	Thermal gain	Physical	Biological
"Restore channel geometry"	Reduce w/d	+	+	-	?	?
"Restore channel slope and sinuosity"	Increase length	-	-	+		

Project Location

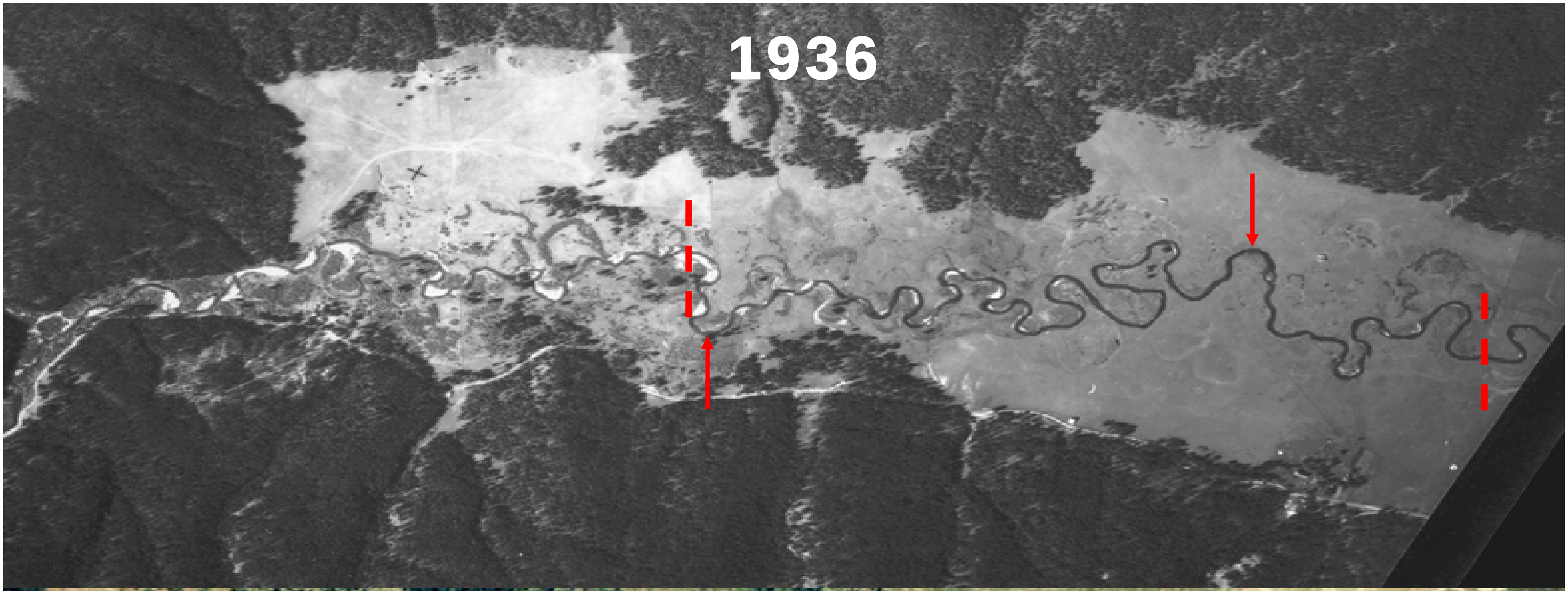


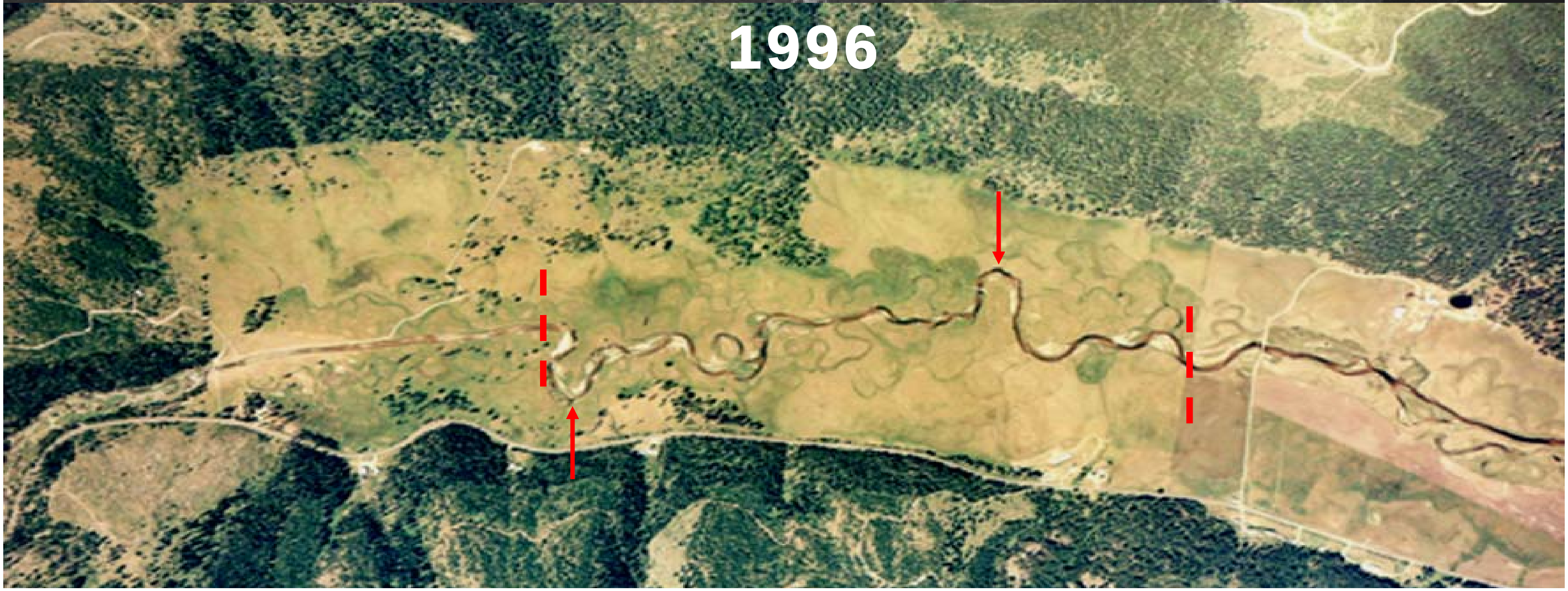


Red River Study Reach

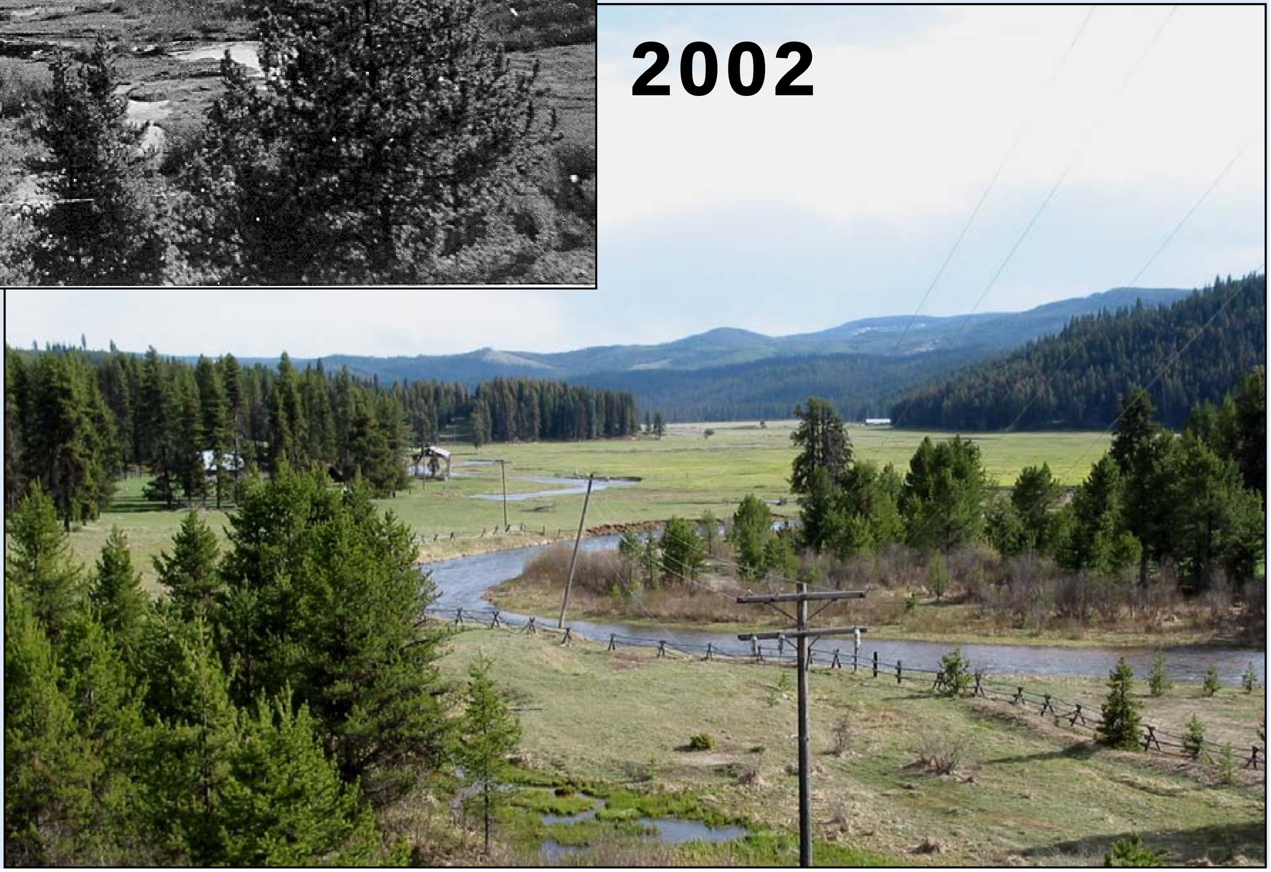
- Lodgepole and ponderosa pine uplands
- Elevation=1280 m (4200 ft)
- Annual ppt (mostly snowmelt)=76 cm (30 in)
- Drainage area=260 km^2 (100 mi^2)
- Bankfull discharge=16.6 cms (580 cfs)
- Alluvial pool-riffle channel; C and E types

- Channel length=4.1 km (2.5 mi)
- Slope=0.0016; sinuosity=2.7


1936

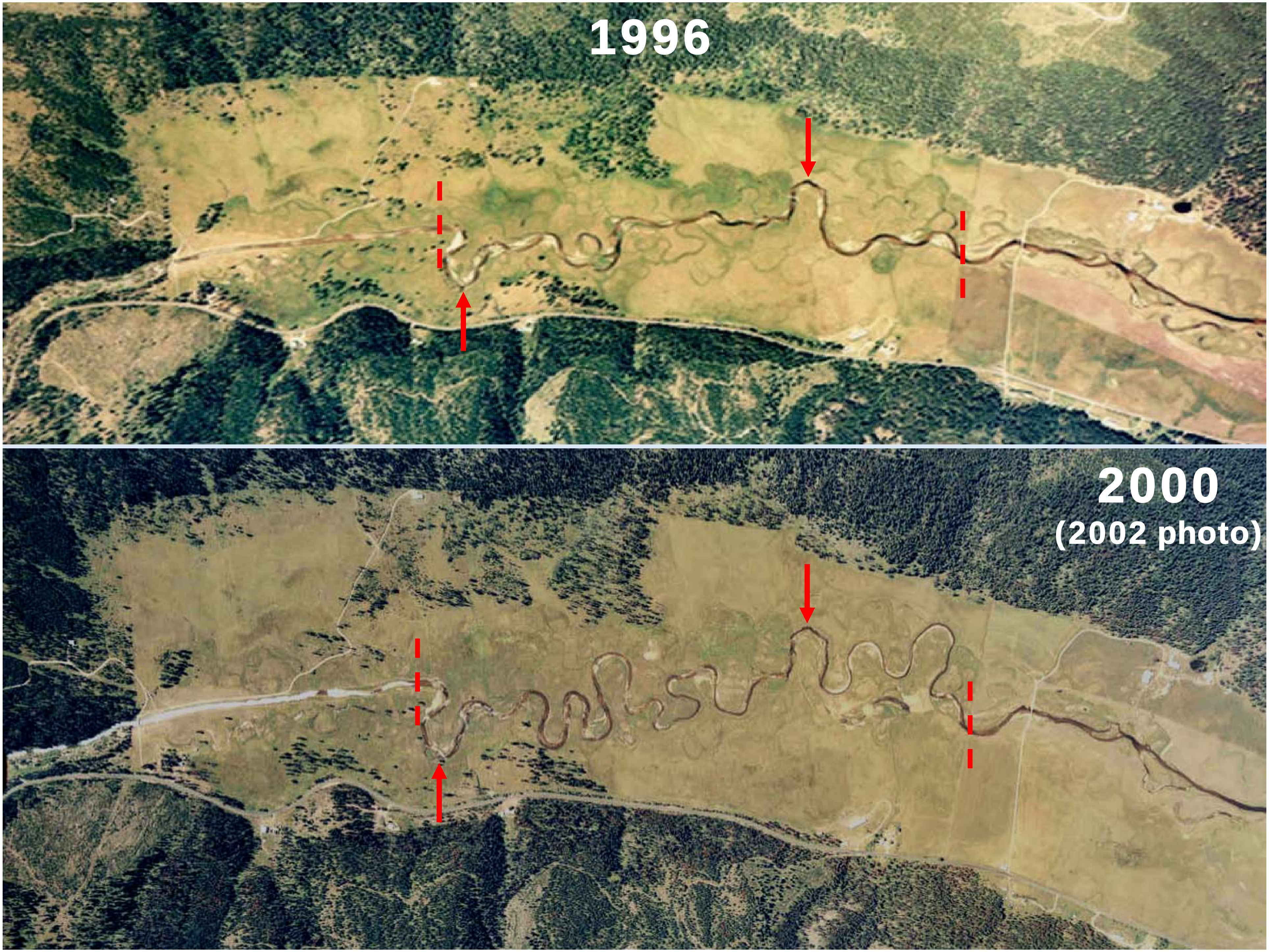

1996


1939

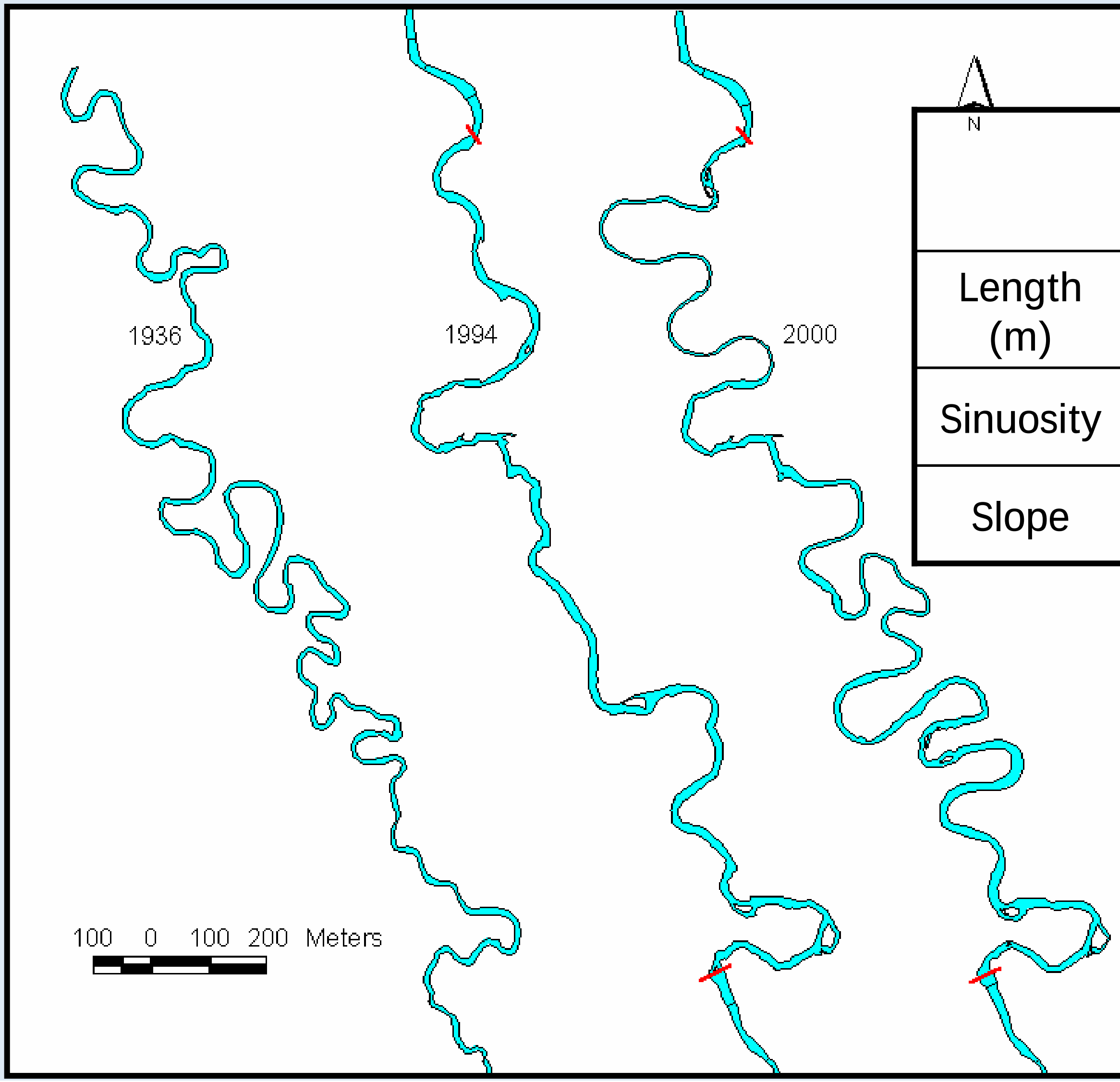

2002

Red River Restoration

- Property acquired to improve chinook salmon spawning habitat by BPA, IDFG, and others in early 1990s
- Restoration included reconnecting channel to historic meanders and constructing equilibrium dimensions
- Completed in four phases from 1996-2000
- "Soft approach" engineering
    - River returned to a self-sustaining state of dynamic equilibrium by restoring physical processes
        - Hydraulic geometry and meander pattern
        - Floodplain hydroperiod and function
        - Sediment transport regime
    - Natural stabilizing force provided by riparian plant communities
    - River unconfined by rigid, unnatural bank stabilization structures


1996
2000
(2002 photo)

Channel Alignments: 1936, 1994, 2000



	Historic (1936)	Before (1994)	After (2000)
Length (m)	3750	2594	4115
Sinuosity	2.4	1.7	2.7
Slope	0.0017	0.0025	0.0016

Study Goal and Objectives

- Investigate the potential for detecting responses to active stream restoration
- Describe natural variability in physical and biological parameters
- Quantify magnitude and direction of change following restoration